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Defeating Rust
The Story *of* Armco Iron

Corrosion

THE AMERICAN ROLLING MILL COMPANY
MIDDLETOWN, OHIO

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THE STORY OF ARMCO IRON

DEFEATING RUST

THIS BOOK
TREATS OF A CONDITION,
A DISCOVERY AND THE
APPLICATION OF
THE REMEDY

(1915)

The American Rolling Mill Co.
Licensed Manufacturers under Patents granted
to The International Metal Products Company.
MIDDLETOWN, OHIO.

BRANCH OFFICES:
Chicago: People's Gas Bldg.
New York: 1556 Hudson Terminal Bldg.
Pittsburgh: 1832 Oliver Bldg.
Cleveland: 952 Rockefeller Bldg.
Detroit: 1820 Dime Savings Bank Bldg.
Cincinnati: 1409 Traction Bldg.
St. Louis: 817 New Bank of Commerce Bldg.

THE TRADE MARK

ARMCO

Carries the assurance that iron bearing that mark is manufactured by

The American Rolling Mill Company

with the skill, intelligence and fidelity associated with its products, and, hence, can be depended upon to possess in the highest degree the merit claimed for it. It has behind it the guarantee of that company concerning the purity of the iron and the accuracy and thoroughness with which each step in its manufacture has been conducted.

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PREFACE

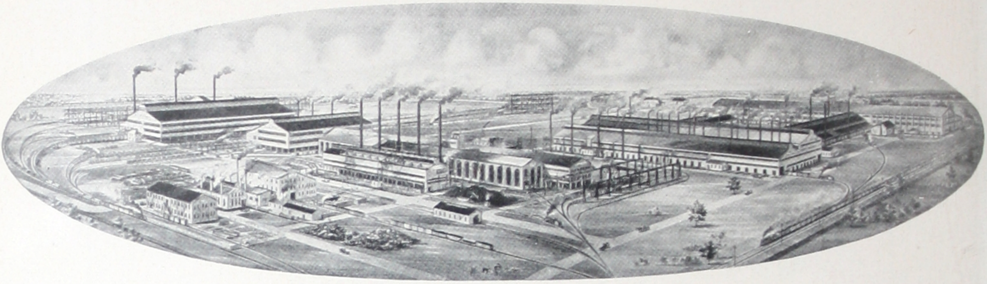
Rust has always been the great destroyer of metals.

This book tells all about the most rust-resistant metal made from iron ore. This rust-resistant metal is pure iron. It is widely known as American Ingot Iron and is trade-marked Armco.

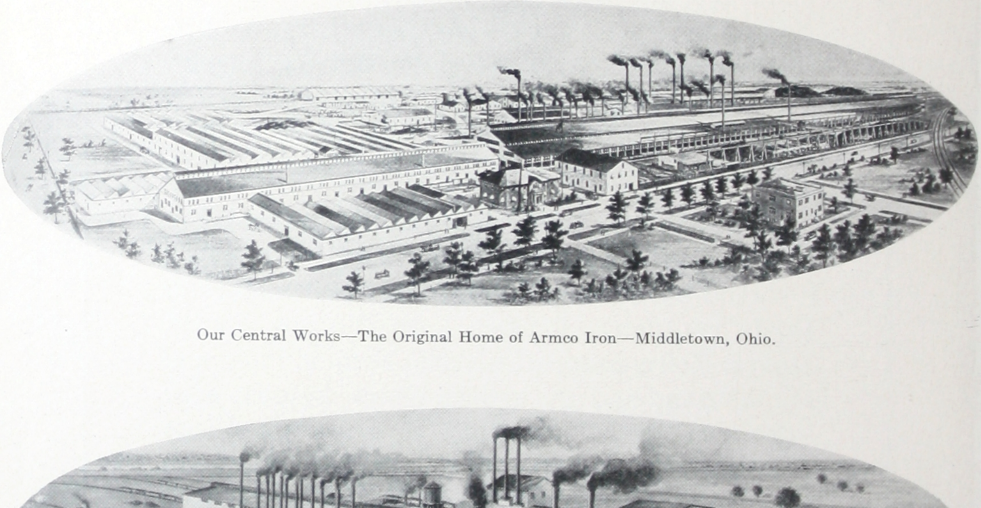
While we show the superior rust-resisting qualities of Armco Iron over other sheet metals, we do not claim it will answer every metal requirement.

For many uses steel is necessary because of its hardness or its tensile strength, but for all purposes where sheet metal is exposed to air, to moisture, to corrosive gases, Armco Iron is superior to any other metal of which iron is the base.

Armco Iron is a twentieth century product, but before the first quarter of this century is reached, it should have displaced all other sheet metals for Roofs, Ventilators, Gutters, Lath, Window Frames, Stoves, Refrigerators, Culverts, Flumes, Pipes and the thousand and one articles where the great need is for a rust-resisting metal. Its superior qualities as a base for enameling, for welding by any process and its peculiar merits for many electrical uses will result in the consumption of immense quantities. Armco Iron is one of the most useful of metallurgical developments.

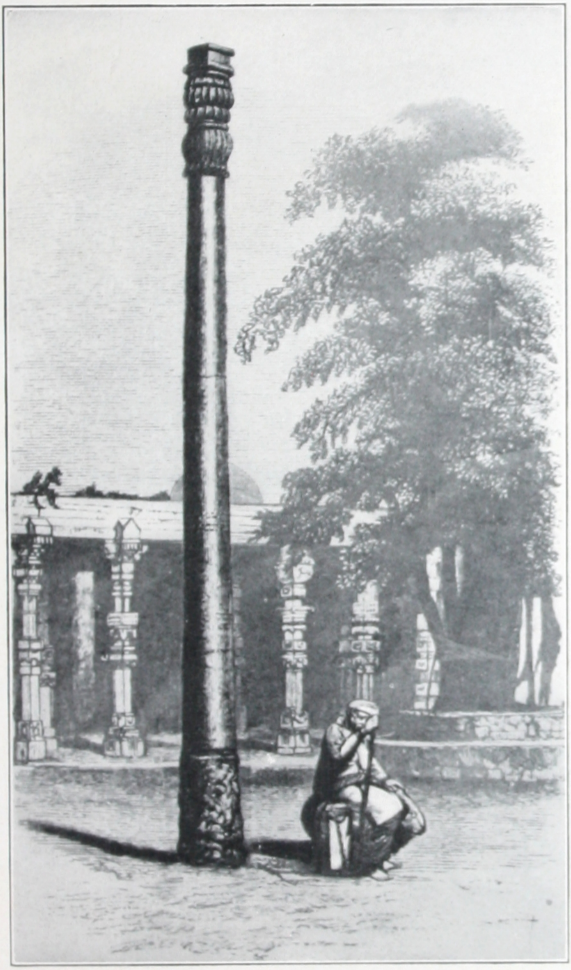


Our New East Works, Middletown, Ohio.



Our Central Works—The Original Home of Armco Iron—Middletown, Ohio.

Our Zanesville, Ohio, Plant.



Twenty-eight centuries of weather have hardly affected this pure iron statue or pillar at Delhi, India. Though the purity of the iron was accidental and not the rule, the statue stands an apparently everlasting example of the rust-resisting qualities of pure iron.

Armco Iron Has Historical Antecedents

In digging around the pyramids, archeologists have unearthed iron tools thousands of years old. In the ruins of the lake dwellers of Switzerland are found buried, under many feet of clay and sand, the iron implements of that ancient people.

Iron link from Newburyport Bridge.

These examples antedate by hundreds of years the iron pillar at Delhi, India, which is one of the wonders of the world with twenty-eight centuries of existence to its credit.

So short, in fact, have been the lives of metals generally, especially when exposed to weather, that even America furnishes sensational instances of rust resistance.

At Newburyport, Massachusetts, was built, in 1798, one of the world's first suspension bridges. The single span was supported by chains of huge iron links. In 1810 some changes were made in the bridge. Then for one hundred years it stood there in rain, the fog, the salt air and the snow. In 1910 this bridge was replaced. The iron chains were still as good as new. After a century or more of exposure they are practically unaffected by rust.

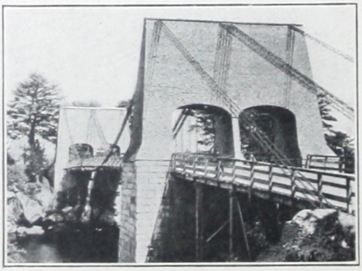
But it is not necessary to go beyond our own memories to find examples of superior rust-resisting qualities.

The last of the old square wrought iron nails have seen three or four generations of the bright, sharp steel wire nails come and go. In the spring of 1914, part of the old Union Station at Cleveland, Ohio, erected 1865, was torn down. Almost sixty years of lake dampness and sulphurous coal smoke had not affected the wrought iron nails. Then there's the old-fashioned tin roofing. Many tin roofs put on sixty or seventy years ago are still good.

The metal roofs put on fifteen or even ten years ago—well, if you put one on then you're probably thinking about re-roofing now, if you haven't already done so.

Rust certainly has made short work of the destruction of modern sheet metal roofings.

These examples of superiority on the part of some metals over others,



Iron chain suspension bridge at Newburyport, Mass. Erected 1798. Remodeled 1810. Torn down in 1910.

to resist rust and corrosion, interested and puzzled us just as they did others in the steel and iron industry. We knew there must be reasons why some iron did not corrode while other metals rapidly rusted away.

Laboratory experiments, numberless analyses, patient research showed that the rust-resisting metals were iron—practically pure iron.

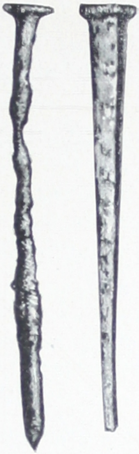
Scientists, too, were working to discover the basic cause of rust. At last came the announcement that corrosion is caused by the presence, in iron, of some other substances.

These successful scientists proved that the presence of other substances, especially manganese, in a sheet of iron induced a destructive electrical action, which turns the iron into rust. (This subject is treated scientifically in Chapter IV—"What is Corrosion?"—by Dr. A. S. Cushman, of the Institute of Industrial Research, Washington, D. C.)

Here, then, were two facts. Our own research showed that rust-resisting iron was pure; the scientists proved that iron in combination with other elements must necessarily rust.

Our problem was to make pure iron. Of course it had been done. But the ages old examples of pure iron were largely accidental. The ore had been remarkably pure; the iron had been refined with unusual results.

The iron links at Newburyport, the wrought iron nails, the tin roofs with their charcoal iron cores—all these had been made by a method closed to us. The old way of making iron could never compete with the new way of making steel.


The old and the new. The wrought iron nail has seen thirty-eight years of use, the steel-wire nail eleven.

We resolved to find a way to make pure iron on a commercial scale—to make it at a cost not too high for anyone who desired lasting, rust-resisting, non-corroding metal sheets. Our quest for the needed method is one of the epochs of iron history.

One by one brilliant metallurgists came to work under the direction of the man who had set himself the task of working out the chemistry and physics of this problem.

Abraham Lincoln's Springfield home with its old-fashioned tin roof, good after seventy years.

From a small room for experimentation, our laboratory has grown into the most completely equipped laboratory in the world for the study of ferrous metals. More than one government sends requests for information and results of tests to the men now in charge of this laboratory.

Though the original problem in its essentials has long been solved, and thousands of tons of pure iron made every year, these men keep on with their research. They are finding new qualities in Armco Iron—qualities that mean new uses. Only a short time ago they succeeded in giving to our iron a polish superior to any yet achieved.

When these scientists of our laboratory show that certain things are possible, we set to work to do these things in our mills. We had to construct great furnaces to take the place of the small forge fires. Tremendous rolls run by a high-powered reversible engine did, on a mammoth scale, that which has been accomplished by hammer and anvil.

"Failure" was the prophecy from the steel industry, but the scientists were right.

We succeeded.

Our mills began to turn out pure iron—iron as pure as the product of the laboratory—and they turned it out on a commercial basis.

You can now get iron that, because of its purity, has a hundred exclusive qualities—the greatest of which is its almost perfect rust-resisting power.

For a number of years this iron was made and sold under the name of American Ingot Iron, but as we more and more realized its distinctive qualities, we felt a growing need for a shorter and more distinctive name.

Laboratory of the American Rolling Mill Company—the most completely equipped laboratory in the world for the study of metals.

We sought a name that would have the same significance in relation to iron that the word Sterling has to silver—a positive assurance of quality—a distinctive mark of identification.

The name we have given is Armco Iron.

Armco Roofing on Coal Tipples and Blast Furnaces.

From The Columbus Iron & Steel Company, Columbus, Ohio:

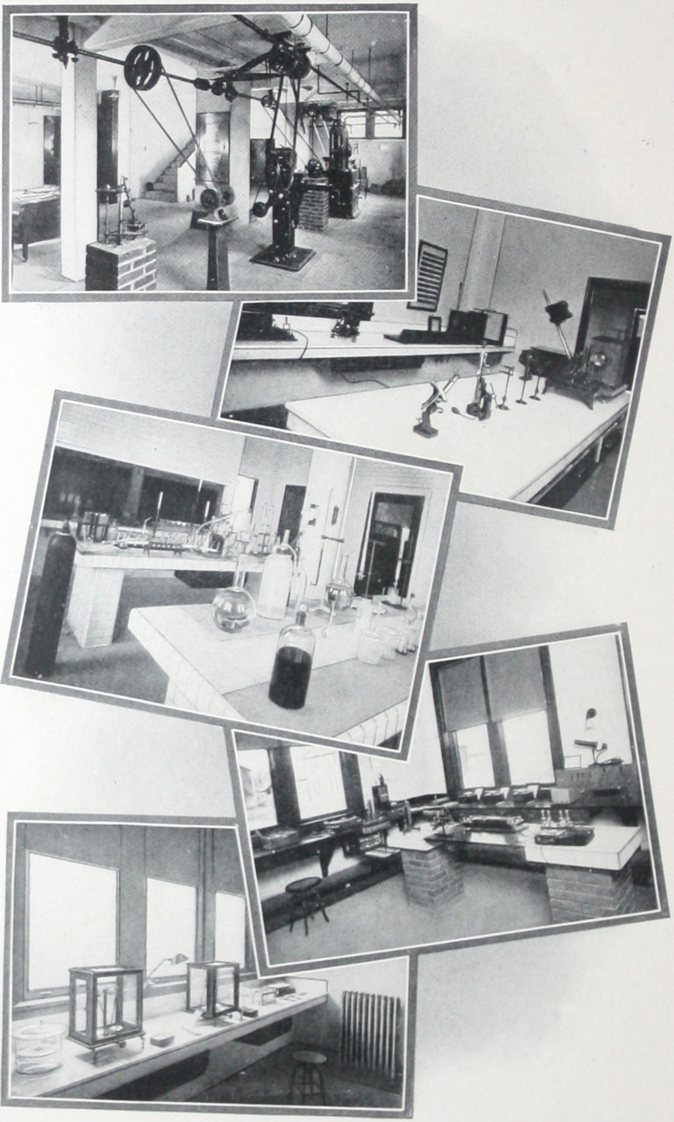
We have used considerable quantities of your ARMCO IRON for roofing and siding, having used both painted and galvanized sheets, and we are convinced that its rust-resisting qualities are far superior to steel sheets.

Six years ago we covered a tipple at our coal mines with galvanized ARMCO IRON. This tipple is located very close to our coke ovens and the metal is subject to the destructive gas from the coke ovens. Both the roofing and siding of the tipple are still in good condition and show very little evidence of wear.

About the same time we covered the stock house at our blast furnace in Columbus with corrugated galvanized **steel** roofing. This stock house is subject to fumes and smoke from the railway locomotives which go through the stock house. In about five years this roof was entirely destroyed and it was necessary for us to replace ite which we did, using in this instance American Ingot Iron, corrugated painted sheets, which, up to the present time, show no evidence of deterioration.

We had an excellent opportunity to compare the rust-resisting qualities of the different materials and the superiority of ARMCO IRON was such that we have adopted it as our standard for the future.

This is the Armco Iron Trade-Mark.



A few views in our laboratory at Middletown, Ohio.

Where Armco Iron Goes

Far the greater part of our tonnage is rolled into sheets and sold to manufacturers using sheet metal.

A portion is drawn into wire for fencing and for pipe rivets.

Increasing quantities of bars and rods are converted to other products.

The remainder we make into sheet roofing, siding, terne plate, Armco shingles, etc., which we distribute through regular trade channels.

The list of manufacturers using Armco Iron and their products is long and ever increasing. Upon request, we will furnish names of manufacturers who use Armco Iron in their products.

Armco Iron has already proved itself possessed of qualities that render it the superior material for:

Advertising Signs,
Arches,
Ash Cans,
Anchor Rods,
Auto Bodies,
Auto Mud Guards and Fenders,
Boiler Tubes,
Brick Pallets,
Bridge Flooring,
Cattle Guards,
Coal Chutes,
Coal and Wood Ranges,
Convertor Hoods,
Cornices,
Corrugated Culverts,
Dipping Vats,
Drain Pipes,
Eaves Troughs,
Electrical Transformer Tanks,
Enameled Ware,
Fence Posts,
Flashings,
Flumes,
Furnaces,
Garbage Cans,
Gas Containers,
Gas Ranges,
Gasoline Tanks,
Grave Vaults and Caskets,
Gutters,
Guy Rods,
Hay Stack Covers,
Hot Water Heaters,
Hot Water Pipes,
Ice Cans,
Irrigation Pipe,
Metal Barrels,
Metal Cars—passenger, freight, tank and mine,
Metal Lath,
Metal Shingles,
Metal Siding,
Metal Window Frames,
Milk Cans,
Motor Boats,
Oil Containers,
Orchard Heaters,
Pole Line Hardware,
Portable Garages,
Petroleum Agitators,
Radiators,
Refrigerators,
Roofing Tin,
Septic Tanks,
Sheet Roofing,
Stand Pipes,
Smoke Stacks,
Silos,
Stoves,
Skylights,
Telephone Wire,
Telegraph Wire,
Terne Plate,
Third Rails,
Ventilators,
Wash Tubs,
Water Tanks,
Well Casing,
Wire Fencing,
Window Screen Frames.

The Purity of the Iron Core is Safeguarded.

The purity of iron has a great deal to do with its rust-resisting power. Our first measure to insure the purity of Armco Iron is taken when we buy a higher grade pig iron than is usually produced.

The other materials that go into the furnace also pass a rigid inspection. We pay a bonus to the workmen who handle the raw material for every lump of impure material they detect and throw out.

Every Furnace Charge of Armco Iron is Chemically Analyzed for Purity.

When the molten mass in the furnace has reached a certain stage of purification, we begin to make chemical analyses of the material. Each furnace house has a chemical laboratory attached where samples can be analyzed as soon as they are taken from the furnaces. The material is not drawn off and poured into the ingots until its purity is equal to or above our guaranteed standard of purity. Armco Iron often runs above our guarantee; it cannot fall below it. There is no chance for even an unusual or accidental drop in quality.

Getting Rid of Gases.

In ordinary steel and carelessly made iron there is usually a considerable quantity of gas in the form of small (perhaps microscopic) blow holes. Such material is extremely poor in respect to rust resistance and working and enameling qualities. At the A. R. M. Co.'s plants, methods for the elimination of these gases have been brought to a high state of perfection.

After the ingots have solidified enough to handle, they are brought to a uniform heat throughout before rolling.

After the ingots are rolled into sheets of thickness required for a specific use, such as roofing, window frames, tanks, refrigerators, etc., the sheets are reheated and run through the polishing rolls.

Annealing Armco Iron Sheets is a Matter of Days, not Hours.

Every effort is made to free Armco Iron sheets from stresses and strains. They are placed in special furnaces and the annealing process is continued for several days at proper and maintained heat. This is much more expensive than a rapid annealing for a few hours at great heat, but it means longer life to the sheets, better working qualities and more complete all round satisfaction.

The Galvanizing on Armco Iron Sheets is Pure.

Armco Iron resists the action of the molten spelter. Ordinary sheet metals dissolve four or five times as rapidly in spelter as does Armco Iron. In fact, galvanizing machinery was almost constantly wearing out until Armco Iron was manufactured and the machinery made from it.

Armco Iron Does Not Dissolve Appreciably in Spelter.

When ordinary sheets are dipped into the spelter they instantly begin to dissolve. The consequence is that the spelter next to the steel sheet carries considerable quantities of a mixture or alloy of iron and zinc. This is very brittle, and breaks away from the sheet when it is bent or formed. This alloy also makes a very inferior coating in its ability to resist weather conditions. It is the purity of the galvanizing and the purity of Armco Iron itself that give the rust-resisting, non-corrosive power that enables it to outlast, several times over, any other galvanized sheet metal to be procured anywhere. We do not hesitate to call this the best iron for exposed conditions made anywhere in the world.

Armco Old Style Terne Plate.

To begin with, our Terne Plate has an Armco Iron base—the purest iron produced anywhere. It is rolled, annealed, pickled and coated under the supervision of a specialist in Terne Plate. Each plate is first worked in hot palm oil for fifteen or twenty minutes and then tinned for 15 minutes in a mixture of 70% pure lead and 30% pure tin—the two indestructible metals. After this they are soaked again for 15 minutes in a pot containing a like mixture.

They are then carefully inspected. The perfect ones are again dipped—by hand—into another 70-30 solution and finished with Lagos palm oil.

After being allowed to drip they are cleaned through sawdust, given a final inspection and carefully boxed for shipment.

Durable Boiler Tubes and Merchant Casing.

From Monongahela Tube Company, Pittsburgh, Pa.:

In regard to our experience with the American Ingot Iron we beg leave to say that, when our attention was at first directed to this material as being suitable to the manufacture of tubes and pipe we did not become interested in it, as we did not believe it to be superior or equal even to a good grade of Open Hearth Steel. For that reason we did not undertake to use it or recommend it to our trade at that time. Later on, however, the increasing frequency of requests for quotations on tubes and pipe to be made of the American Ingot Iron led us to investigate and test its merits. The result was we had to confess that our former opinion was a mistake and not based on fact, but rather perhaps on a disinclination to experiment with a new, and to us, an untried material. The ambition of this Company having been during the sixteen years of its operation to turn out the best possible things in its lines of manufacture and to maintain a high reputation for the quality of its output—we then at once began to use the American Ingot Iron in the manufacture of tubes and pipe and to recommend it to the trade in all cases requiring a durable rust-resisting material. The results from this action have been very gratifying to us.

In no case where we have furnished our trade with this material have we had an adverse report and the several cases of additional orders given us for tubes and pipe to be used under severe conditions have completely convinced us that in the genuine American Ingot Iron as produced by your Middletown plant we have a material that we may confidently recommend to the users of tubes and pipe in every case where only the best is wanted. We very confidently look for an increasing demand for American Ingot Iron tubes and pipe.

We are now prepared to furnish Boiler Tubes and Pipe from 1½ to 8 inches and Merchant Casing from 2¾ to 8¼ inches made from your genuine American Ingot Iron produced at your Middletown plant.

Important

Every sheet of Armco Iron, whether black or galvanized, is stamped with the Armco Iron Trade-Mark before it leaves our mill.

You will be able to see this trade-mark in blue on all roofing, culverts, sidings, silos, etc., wherever the sheets have not undergone much change. On such articles as are enameled or greatly changed in form you should insist on being shown by conclusive proofs that the material is the rust-resisting Armco Iron.

If you are in doubt our Research Department will analyze a sample of the material for you. If you are sold Armco Iron be sure that you get it. We will help you without making any charge.

Ask our Research Department, too, about the suitability of Armco Iron for any purpose for which you think of using it. The men in this department will gladly advise with you. They will experiment for you. They will tell you whether galvanized or black sheets will serve you best. They will tell you about its tensile strength, its welding qualities, the stamping possible with it, its electrical conductivity—anything you wish to know—that Armco Iron may serve you better than heretofore—better than any other metal can serve you.

Our Research and Service Department costs us more in salaries alone than it costs to maintain the Departments of Physics and Chemistry of some of our largest universities. Remember these men are at your service in working on real problems. We know of no other group of men in the world so capable; there is no other laboratory so well equipped.

It is the services of these men as well as a non-corrosive, rust-resisting iron that you gain by the use of Armco Iron.

What is your question? Put it up to our Research and Service Department.

Here are two questions and answers of this kind.

No. 1. Oklahoma City, Okla., January 3, 1914.

American Rolling Mill Co.,
Service Department,
Middletown, Ohio.

Gentlemen:

I have been wondering whether your special brand of material known as Armco Iron would be suitable for the lining of our ice wagons. We have a number of steel-lined wagons, but this material rusts and wears out so quickly that we have been seriously considering the use of sheet copper. Would you recommend your product for this use?

Yours truly,
JOHN G. SIMMONS.

Middletown, Ohio, January 8, 1914.

Mr. John G. Simmons,
Oklahoma City, Okla.

Dear Sir:

Your inquiry of the 3d inst. is at hand, and we thank you for the opportunity of taking up with you the adaptability of Armco Iron for your special purpose.

Armco Iron (or American Ingot Iron, as it is quite widely known) is, on account of its high purity and rust resistance, adapted to nearly every exposed metal installation where the principal destroying influence is rust or corrosion. So far, we do not know of many instances of its use for lining ice wagons; but it is extensively employed for the interior of refrigerators, and, our customers tell us, with perfect success. The great ductility and workability of this metal make its use advantageous in such cases as those you inquire about, since these qualities enable it to be drawn and flanged, not only without cracking the sheets, but with the least amount of the permanent strains which with more brittle materials act unfavorably in respect to corrosion resistance.

We believe that you will find Armco Iron well adapted to the lining of your wagons. The Dixie Metal Culvert Co., of Shawnee, Okla., carry a stock of this material, and can no doubt meet your requirements on short notice.

Yours very truly,
AMERICAN ROLLING MILL CO.
Service Department.

No. 2.

Richmond, Va., April 20, 1914.

American Rolling Mill Co.,
Service Department,
Middletown, Ohio.

Gentlemen:

In many specifications which are intended to secure high-purity iron for exposed sheet metal work, I notice a great deal of stress being laid upon the galvanizing, the quantity per square foot and its freedom from cracks and other blemishes. When the galvanizing is on a pure iron base, which we suppose to be highly resistant to rust, it seems to me that some of this extreme care as to the coating might be dispensed with.

Will be glad to receive any information you can give me on this subject.

Respectfully,
CHAS. H. GOODWIN.

Box 328.

Middletown, Ohio, April 25, 1914.

Mr. Charles H. Goodwin,
Box 328,
Richmond, Va.

Dear Sir:

Replying to your letter of the 20th, on the subject of the galvanizing specifications for exposed sheet iron work, we consider these very important for the following reasons:—

1st. Well-made iron of a high degree of purity takes the spelter coating in the galvanizing pot better than steel does, and retains it much more tenaciously. The great ductility of pure iron, and the comparative absence of iron-zinc alloy between the zinc and the iron, result in the galvanizing being much more firmly held in bending and flanging operations. The condition of the galvanizing on a finished product is therefore one of the indications of the character of the base metal.

2d. Iron of the highest purity is very highly rust-resistant, but it is not **rust-proof.** As long as the zinc coating remains perfect the iron is absolutely protected, and even after the spelter is cracked and broken it still serves as a valuable protection, because of its electro-positive relation to the iron, as this results in the zinc being the victim of corroding forces instead of the iron. This is the reason for specifying not less than 2 oz. per square foot of spelter coating.

3d. Armco-American Ingot Iron, as compared to the ordinary sheet metals, is very like cedar for fence posts as compared with pine. The cedar will last very much longer in any case; but if it is given the further protection of a good coat of paint, its service life is still further increased.

We believe you will find it well, in drawing your specifications for sheet metal work, to insist upon quality in the galvanizing as well as in the base metal.

Yours very truly,

AMERICAN ROLLING MILL CO.
Service Department.

The Mark of Quality.

What Scientists Say

The discovery of the cause for the corrosion and rust of metals and the successful manufacture of a non-corrosive pure iron opened a new era in metallurgy.

Scientists—men not at all interested in a commercial way—have made many experiments upon this new pure iron—Armco Iron.

The new process is essentially one whereby a degree of purity equal or superior to that of the old-fashioned genuine charcoal iron and a corresponding thoroughness and evenness of working are attained by modern labor-saving methods, thus making possible the manufacture of iron of the very highest grade on a commercial basis.

Of the many expressions of scientists who have worked with Armco Iron, the following are typical:

"The Manufacture of Pure Iron in the Open Hearth Furnace."

From Dr. A. S. Cushman:

Comparison of Steel, Wrought Iron and Armco Iron.

"This pure iron, made in an open hearth furnace, has become generally known in this country, and to a certain extent in Europe, as 'Ingot Iron.'

"Considerable attention has been paid to the physical properties of this new iron, and comparisons between it and steel and the purer forms of wrought iron have been made. In tensile strength it closely approximates high-grade, well-rolled charcoal iron, and in elongation and reduction of area it not only equals but in many cases surpasses the finest soft steel.

"It is a well-known fact that iron is usually inferior to steel in elongation and reduction of area. Owing to its more steel-like qualities in this respect, therefore, pure open-hearth iron becomes available for deep drawing and stamping purposes, where very often ordinary wrought iron is unavailable, and steel must usually be employed. These pure ingot irons, while perhaps not equal to mild steel under certain strenuous conditions, in most cases proved themselves to be adaptable. In fact, it is claimed for them — and reasonably so it seems to the writer — that they appear to combine to a high degree the good qualities of both iron and steel with a comparative absence of at least some of the undesirable qualities of each.

Impurities Can Be Eliminated.

"The subject of the corrosion of iron and steel is receiving so much attention at the present time that the effort has been made not to discuss the problem particularly in this paper. The fact remains, however, that the elimination of the metallic metalloidal and gaseous impurities in iron can be made, as is shown by the production of these pure irons in the open hearth furnaces, contributory to a high degree of excellence and homogeneity. It would seem to follow, as a matter of course, that the elimination of the well-known impurities which are likely to segregate, will minimize the tendency towards the production of material lacking in evenness of texture and homogeneity.

"After reviewing all the evidence available, both favorable and unfavorable, the writer is willing to affirm today that his belief in pure iron as a valuable article of commerce is stronger than it ever was before. He believes when all the prejudices and interests have been left aside, and when the truth, which always has and always must prevail, is appreciated, that this new metallurgical movement is thoroughly in keeping with, and a necessary part of, the greater movement for the conservation of our natural resources."

"The Corrosion of Iron and Steel"

From Prof. Bradley Stoughton:

"In short, manganese is only one, although perhaps one of the worst, of the evils we have to contend with. We should expect to find that the most resistant metal would be the one which was most homogeneous in composition, and because the less the amount of impurity the less opportunity there is for uneven distribution of it, we should expect that the purer the metal the more resistant it will prove to be.

"Both of these theories are borne out by the facts as we know them, and it has been found good practice to reduce all impurities, not only manganese, but sulphur, silicon, carbon, and also gases, which may occur combined with the metal occluded in it, or separated in the form of blow-holes.

Blow-holes, Gases, Oxides and Slag Hasten Corrosion.

"Most analyses of iron and steel take no account of blow-holes, gases, segregation, or entrained oxides and slag, and on this account are deficient from the standpoint of indicating the quality of the metal as regards resistance to corrosion.

Armco Iron Has Greatest Purity.

"It will therefore be readily understood that any irregularity in the composition of the metal which produces a difference in potential between two parts, no matter how close together, will increase the rate of corrosion, and this is no doubt one of the important reasons why metal charged with blow-holes or occluded gases, or in which the impurities are segregated, has rusted faster than better made material. The presence of compounds, such as mill-scale, iron-manganese, and silicon-oxides, iron-sulphides and slag, has the additional harmful effect of forming surfaces upon which the union of oxygen and hydrogen will take place more rapidly, and therefore increase the solution of iron.

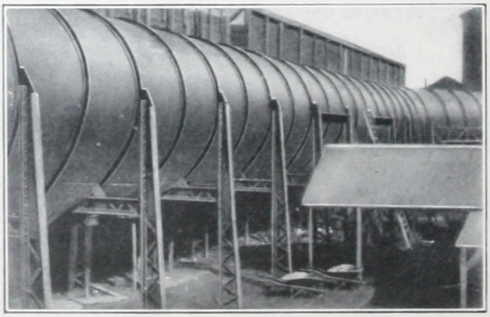
We Do Avoid Blow-holes, Oxides and Slag.

"The high degree of purity of AMERICAN INGOT IRON, especially if the manufacturers of it have succeeded also in avoiding blow-holes, oxides and slag, is a very advantageous feature and should recommend it to users, on theoretical grounds at least."

Bending and Flanging Armco Iron.

Armco Iron may be bent cold or worked hot, at dark cherry red, or above a deep orange color. In flanging at high temperatures, sufficient surface must be heated to avoid bending too near the cold part of the iron.

Dark cherry red is the safest and easiest point at which to work Armco Iron. At that point there is no danger of a critical condition.



Heavy fume-pipe, 12 feet in diameter and 650 feet in length, for precipitating ore dust and carrying fumes and gases from six blast furnaces to the stock. Erected by the Ruemmeli-Dawley Manufacturing Co., St. Louis, for the St. Joseph Lead Company, Herculaneum, Mo.

Where The Government Uses Armco Iron.

The United States Government has used large quantities of American Ingot Iron in connection with the following projects:

Panama Canal, Yellowstone National Park, Chickamauga National Park, Yosemite National Park, Glacier National Park, U. S. Reclamation Service, U. S. Indian Service and U. S. Forest Service.

Some very large installations of Armco Iron flumes have been made recently by the U. S. Reclamation Service.

The use of roofing sheets and other building sheets has been very extensive under the authority of the various departments.

Two years ago we made one shipment of over 500 tons to the Philippines on a government order. We have had many repeat orders since. Last year one order of 200 tons was filled for the making of U. S. mail boxes and posts.

What Engineers Say

From H. P. Saunders, M. E., Herculaneum, Mo.:

St. Joseph Lead Company Built a 12-Foot Fume Pipe 650 Feet in Length of Armco Iron.

"After exhaustive tests, we have decided on the American Ingot Iron (Armco Iron) for six hundred and fifty feet of rectangular and balloon flue, taking the gases from six blast furnaces and to the stock and bag house system. These flues will be of $\frac{3}{16}''$ metal and will involve so large an expenditure that we could not afford to make mistakes.

In Convertor Hoods Armco Iron Lasted More Than Twice as Long as Steel.

"In regard to the use of Ingot Iron (Armco Iron) I will say that I have used it in convertor hoods where the service was exceptionally severe and the corrosion of ordinary steel so rapid that these hoods had to be replaced on an average of every three or four months. My observation was that the Ingot Iron (Armco Iron) had over twice the life of ordinary steel, and in the places where it was used, after the second steel had been placed beside the ingot hoods, the ingot iron (Armco Iron) still appeared to be in first-class condition."

From E. G. Luerring, Engineer, Davis Bournonville Co., Chicago:

Armco Iron Offers Greatest Resistance to Corrosion.

"In our work the conditions for rapid corrosion are almost ideal.

"We have found that Armco Iron resists this corrosion to a very much greater extent than any other steel we have been able to purchase, and you may be sure that we have tried a great many of them.

Armco Iron Welds More Easily and Smoothly Than Any Other Sheet Metal.

"We have also used Armco Iron extensively in the manufacture of tanks, all of which are made by our welding process. In this connection we can freely state that Armco Iron welds very much more easily and smoothly than any other steel with which we have come into contact. Our continued orders have probably given you an indication of the satisfaction we have felt."

What Users Say

Best for Corrosion Resistance and as a Base for Enamel.

From The Globe Stove & Range Company, Kokomo, Indiana:

Enclosed you will find an order for another car of Armco Iron, which we hope you will be able to deliver by not later than August 15th.

I am going to take this occasion to compliment you on the finish of the polished sheets in the last shipment, because the wonderful progress in refinement is quite noticeable.

I believe we were the first stove manufacturer to use Armco Iron, and for your information, wish to state that every car we have received from you since 1906 has been analyzed by our chemist and the results have been practically uniform, the only difference between your sheets now and nine years ago being in the finish.

The Twenty-five Year Insurance that we placed upon the sheet metal bodies of our stoves, made from your product, was at first received by the trade somewhat skeptically, but now our customers are featuring it confidently. The reason is, we have convinced our customers that Armco Iron is the best corrosion-resisting metal and the most suitable for stove construction.

It may interest you to know that we have specified Armco Iron for the white enamel sheets that we will use in building our electric ranges. We find that enamel covers your sheets more uniformly and with fewer defects than any other stock.

Lasting Qualities.

From Maurice Alvin Long, Architect, Baltimore, Maryland:

In reference to the lasting qualities of Ingot Iron, a very good comparison can be made in favor of Ingot Iron as against steel on the coaling station at Sir John's Run, W. Va.

The engines taking coal, stand directly under the coal bin, which is covered on the sides and roof with Ingot Iron. The hand-rail on the steps leading up to the top of this bin is of ordinary steel pipe. In two years' time this hand-rail was so badly disintegrated that it could be crushed by anyone of ordinary strength by gripping with their hand. The Ingot Iron has been on for approximately five years, and is in good condition, showing very little, if any, signs of rust.

Superior Service.

From Indiana Steel & Wire Company, Muncie, Indiana:

It affords us pleasure to refer to the quality of American Ingot Iron, having used a great many different kinds of roofing material, we are frank to admit that this roofing has given us far superior service than any other material we have tried. We have used this roofing on a number of buildings and especially is it adapted to work requiring severe tests as to corrosion and deterioration from acid fumes, such as we have in our cleaning house.

We trust that the material ordered on our recent order to be used on our new cleaning house will prove as satisfactory as the material we have used in the past.

You may use our name as a satisfied user of Armco Iron and will be pleased to answer any inquiries referred to us.

What Users Say

Most Nearly Non-Corrosive.

From F. S. Lang Manufacturing Company, Seattle, Wash.:

Due to our special need for a very high-grade sheet iron, used by us in the manufacture of stoves and stove pipe, we can freely say that after experimenting with various makes and kinds of iron we find that the many excellent qualities of Armco Iron meet our requirements in the best manner possible.

As we have had considerable trouble with other irons not being sufficiently rust-resisting, we were pleased to find that Armco Iron works easily and is so nearly non-corrosive that we have no trouble whatsoever on that score.

We shall continue to use Armco Iron in increasing quantities.

Resistance to Severely Corrosive Conditions.

From Merkle Wiley Broom Company, Paris, Illinois:

From our experience with Armco Iron we believe it the best of its kind made in the U. S. today. As we wrote you some time ago, we have had some of the American Ingot Iron in our bleach room for over two years and it does not show any corrosion or any effects of the brimstone fumes. Any one familiar with the bleach room of a broom factory knows that it does not take brimstone fumes very long to eat up any ordinary iron it comes in contact with, also soon ruins the brick and mortar used in the walls.

We would not think of using any other kind of iron but American Ingot in any place in our factory.

We are very glad to see other manufacturers using this iron in their products, and allowing the purchaser to specify American Ingot which has become very favorably known all over the U. S.

Best Results in Welding.

From Owosso Boiler Works, Owosso, Michigan:

I have to relate to you a little experience that we have had with the American Ingot Iron. We bought an Oxy-Acetylene machine and heretofore we had been paying 12 cents per pound for wire to weld with, but the experience that we have had led me to think that we could find nothing better than it, to use in connection with our welding, so we have taken some No. 10 and sheared it in small strips and have been using it in the place of the welding wire mentioned.

We find we can get much better results from this American Ingot Iron, as it flows more freely and is tougher than the material that we have been using, manufactured for that special purpose.

Very Best Material for Brick Pallets.

From Standard Refractories Company:

In reply to your favor of the 8th, your American Ingot Iron Pallets are giving us entire satisfaction.

We believe material of this kind is the very best for use in making brick pallets.

What Users Say

Better Results and Fewer Losses in Enameling.

From Buck's Stove & Range Company, St. Louis, Mo.:

Replying to your favor of the 1st inst., requesting our experience in the use of Armco Iron, desire to state that we adopted this material primarily because of the fact that we could use it with spot welding on our steel ranges.

We had been unable to obtain a material which had a high polish and which could be successfully spot welded, prior to the time of our using your material. We are also using it because of our belief in its rust-resisting qualities, which were demonstrated to the writer on a recent visit to your factory where he saw the exhaustive tests made to prove the rust-resisting qualities of your Armco Iron.

We have no first-hand information regarding the desirability of this material for enameling purposes, but make all of our enamel parts of Armco Iron for the reason that the Enameling Company doing our work, advises us that they get very much better results and fewer losses with this material than with any other. We expect to continue to use your material for the above purposes.

Armco Window Frames in Steam and Acid Fumes.

From Voightmann & Company, Chicago, Illinois:

We have used Armco (American Ingot) Iron for so many years that we have come to believe that it has always been our policy to urge its use by those who were at all inclined to recognize quality. We believe that we were among your first customers and know that we made the first hollow metal windows of this material.

Office buildings and hotels take about one-half of our product, the balance being installed in industrial plants of every conceivable kind, a good share going to the packing houses throughout the country. Armco has helped us to give satisfaction to the owners of all of these. In some of these there is great and constant dampness, in others, notably the fertilizer factories in packing plants, there are constant acid fumes and clouds of steam to set up corrosion that has speedily destroyed windows made of any other material. Every job we have ever made of Armco is today in good condition, none of them have ever been repaired and none of them need repairing.

ARMCO is a word of few letters, but it spells Satisfaction to those who are wise.

Greatest Resistance to the Action of Molten Spelter.

From The Canton Sheet Steel Company, Canton, Ohio:

Replying to your favor of the 30th ult., we are pleased to advise that we have been using your Armco Iron for cut gears on our galvanizing machine with very satisfactory results, finding that it affords greater resistance to the molten spelter than any of the other special steels which we have heretofore used, and we would not hesitate to recommend it to any one using gears under similar conditions.

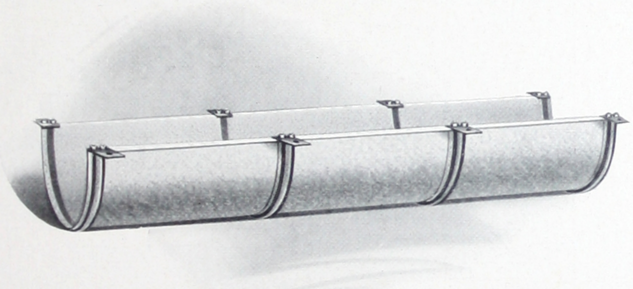
Armco-American Ingot Iron Flume

Where irrigation cannot be carried on in open ditches, or where it is desirable to eliminate the serious seepage losses of this method, Armco Flumes offer advantages over wood and steel that simply cannot be denied.

Wood is expensive and troublesome. Steel rapidly rusts and soon leaks. Armco Flumes, pure iron with two ounces of zinc coating to the square foot, carry the water with no up-keep expense. The only cost is for the installation.

The Construction of an Armco Flume.

Armco Flumes are made of Galvanized American Ingot Iron Sheets formed in a semi-circle, clamped together and suspended from the substructure by rods.



The construction of an Armco Flume.

The joints of an Armco Flume are absolutely water-tight, and the inside surface is almost perfectly smooth, hence the remarkably low coefficient of friction and high capacity.

No Cross Bars Impede the Flow of Water.

There are no cross bars on the smaller and medium sizes, and but few on the larger. Cross bars are apt to catch weeds, leaves or branches which dam up the flume and cause losses by overflows. Hundreds of these flumes, many of them of great length and the largest capacity, are giving perfect service throughout the irrigating regions.

Armco-American Ingot Iron Culverts

Armco Iron probably made its first bid for fame in culvert form. It was here that its rust-resisting and non-corrosive powers stood out in dominance over all other metals. These qualities have led to its very general adoption in America.

Durability of Armco Culverts.

The durability of Armco Galvanized Corrugated Culverts is insured by the purity of Armco Iron and of its galvanizing. They are all galvanized with not less than two ounces of coating per square foot. The culverts are solidly riveted and joined from one end to the other with Armco Iron rivets. The ends cannot cave-in even though undermined.

Water Freezing in Armco Culverts will not Crack Them.

The elasticity which comes from the corrugations in Armco Culverts provides for the expansion of freezing water and for all the ordinary shifts and settlings of foundations. They cannot crack as culverts of cement or cast iron often do. They are of enormous strength in proportion to the material employed. Properly installed, they never fail.

From J. H. Hoskins, Chief Engineer of Highway Commission of
Dickson County, Dickson, Tennessee:

Your favor of March 4th, inquiring for my experience with metal culverts to hand today, and in reply will say that during the past twelve years I have been trying out the various culvert metals now on the market, and have decided that culverts made of American Ingot Iron are far superior to any others that I have used.

I was employed as Chief Engineer of the Robertson County Tennessee Pike Commission and under my direction this Commission expended over $500,000 for highways and bridges. Immediately before they employed me as Chief Engineer they made a contract with a culvert manufacturer to furnish them with metal culverts for the entire contract. These culverts were guaranteed to be as good as American Ingot Iron, and were priced 15% cheaper. The first shipment of two car loads was used before the analysis was received from the testing laboratory. This analysis showed that the samples cut from the end-sheets were 99.87 and 99.858 pure iron, and the samples cut from the centers of the culverts were 99.39 and 99.31 pure iron. These samples were sent on September 3rd, 1913.

After this analysis was received the Commission refused to use culverts made of this material as it was not up to specifications and they immediately made a contract with manufacturers of American Ingot Iron culverts. The four samples, cut at random from a two car shipment of American Ingot Iron culverts, analyzed 99.88-99.89-99.92 and 99.94.

After some of the culverts made by the .... had been in service for 15 months, I found it necessary to remove a 24 and an 18-inch culvert to install concrete arches, the culverts being too small. Each of the culverts were 40 feet long, and with the exception of the end sheets, the culverts were entirely rusted through along the bottom, and were unfit for re-installation. This was on the Wessyngton Pike, ¼ of a mile West of New Chapel Church.

I found it necessary to remove two 24-inch culverts made of this same material, from the pike between Orlinda and Handleyton. These had been installed 27 months. They were not rusted entirely through, but were badly pitted and unfit for further use.

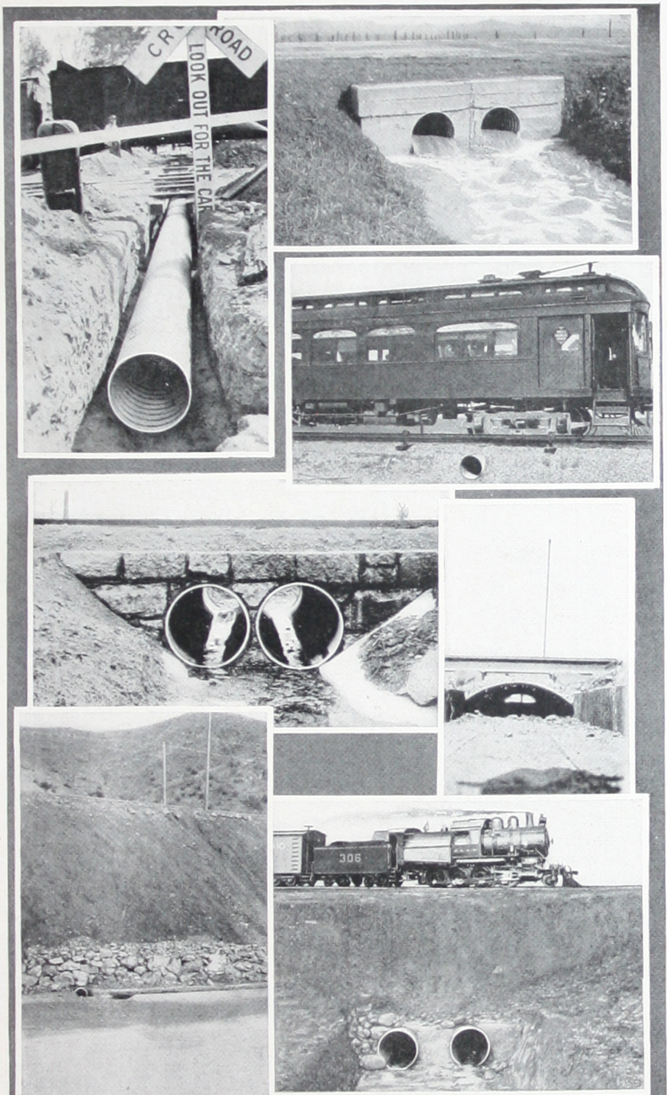
During the construction of the Robertson County highways we found it necessary to remove numerous culverts that has been installed by the District Commissioners. These culverts were bought from six different manufacturers (according to the County Records) and with one exception, none of them could be used again on account of them being corroded and rusted out.

During the construction of the Beets Road, which runs West from Greenbrier, the weather was unfavorable to concrete construction, and I installed three 24-inch American Ingot Iron Culverts under one fill, with the expectation of removing them as soon as the weather permitted concrete construction. For several reasons we did not get to do this work for 31 months after installing the culverts, and when they were removed they were in perfect condition and were immediately installed in other places.

The Pike Commission sold to the John Porter Ice Co., 75 feet of 15-inch American Ingot Iron culvert which he used at the Ice Factory.

This culvert was installed in a driveway made of fresh coal cinders, and carried the water from the cooling system and other waste water. I have been watching it to see the effect the sulphuric action from the cinders, and ammonia from the waste water would have upon this metal, and on the 28th of Feb., 1915, this culvert was in perfect condition after three years service.

These tests under actual working conditions have demonstrated to me that it is much more economical to purchase culverts made of American Ingot Iron, even though they cost a trifle more than the "just as-good" kind.



A few installations of Armco Culverts.

Armco Iron for Tanks

Armco Iron is particularly well adapted for use in tanks and containers of all kinds. Its rust-resisting and non-corrosive properties give that long life which makes it the economical material. Its physical or working qualities render its use for such purposes easy and satisfactory.

Armco Iron is soft, ductile and tough. Owing to the care we take in rolling and annealing, the stresses are so equalized that the sheets can be worked in either direction without showing any signs of cracking.

The physical properties of Armco Iron test bars have been determined as:

Tensile Strength, 38,000 to 44,000 pounds based on $\frac{7}{16}$-inch plates.
Elastic Limit — one-half of Tensile Strength.
Elongation, 22% in eight inches.
Deduct 1% from elongation for each decrease of $\frac{1}{16}$ inch below $\frac{7}{16}$ inch.

The 100% welding quality of Armco Iron stands it in good stead for such containers as the petroleum agitator shown on the following page.

Armco Iron rivets can also be furnished for use in building tanks, rendering the whole structure proof against untimely rust or corrosion.

300,000-Gallon Elliptical Bottom Steel Tank and 50,000 Cubic Foot Gas Holder built for Ford Motor Company at their Detroit Plant. This tank is 129 feet to the bottom. The gas holder and its water tank and most of the 300,000-gallon sprinkler tank are built of Armco Iron. Manufactured by the Chicago Bridge and Iron Works, Chicago.

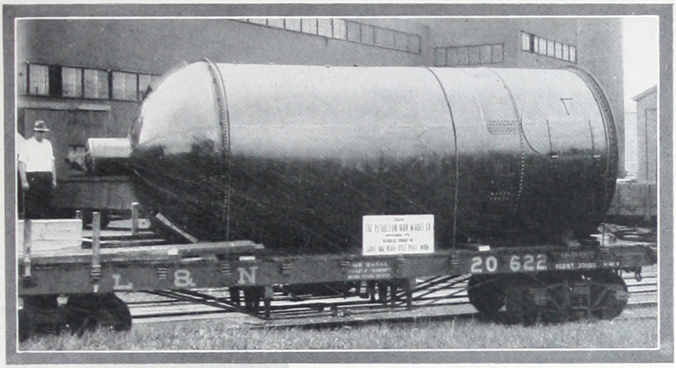
We have recently received the following letter from our representative at St. Louis with regard to the Gas Holder at Kansas City which is pictured on the following page.

Several days ago, it was the writer's good fortune to be able to inspect the large 5,000,000 foot Gas Holder built some time ago in Kansas City by the United Gas Improvement Co., and now owned exclusively by the Kansas City Gas Company.

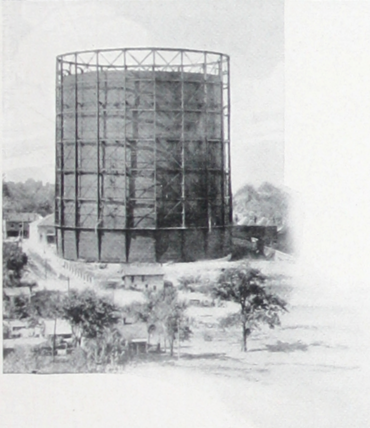
The Sheathing of this Holder is made of Armco Plates, and while the different sections are alternately submerged into water and lifted into the air, we did not find one sheet which showed any signs of corrosion, excepting where there seemed to be occasionally some foreign substance in the paint, which had caused a very slight rust spot.

In contrast to this condition of the Armco Plates, we found that all of the rivets, which were of steel, had pitted badly, necessitating Sand Blasting in preparation for an additional cost of paint.

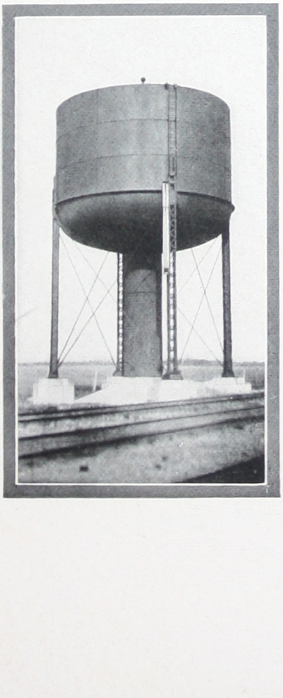
This whole proposition struck the writer as a wonderful performance, and not only gives a splendid illustration of the difference between iron and steel, but greatly impressed the Engineers of the Kansas City Gas Co., who immediately became interested in our material for meters and other sheet metal work, about which we wrote you some time ago.



Agitator. built of Armco Iron by The Petroleum Iron Works Company, Sharon, Pa. Capacity of agitator, 150 bbls.; 10 feet diameter, 23 feet high. Welded throughout except the roof.



Armco Iron Gas Holder. Capacity 5,000,000 cubic feet; diameter, 193 feet; total height, 235 feet. Erected by the Stacey Manufacturing Company, Cincinnati, Ohio, for the United Gas and Improvement Company, Kansas City, Mo.



100,000-Gallon Railroad Service Tank, 20 feet to bottom, built for the C. & E. I. Railroad Company at Findlay, Illinois. This tank was built with an Armco Iron bottom. Manufactured by the Chicago Bridge and Iron Works, of Chicago.

Monroe Building, Chicago, with Armco Iron windows.

Railway Exchange Building, St. Louis, Mo. Largest mercantile and office building in the world.

New York Telephone Company's Building, New York.

Armco Iron in Building

An exhaustive article on the value and uses of Armco Iron in building would be as lengthy as this entire book.

Such an article would discuss the superiority of pure iron—Armco Iron—over other sheet metals for roofs, whether corrugated, standing seam or terne plate, cornices, eaves troughs, gutters, flashings, drain pipes, skylights, ventilator ducts, steam and water pipes, lath, window frames, siding, ceilings, arches, shutters, awnings, etc. We do not ourselves manufacture all these articles, but any dealer in building material can secure them in Armco Iron.

Architects Specify Armco Iron.

Architects more and more specify that the sheet metal about buildings be Armco Iron. The purity of the iron, the quality of the galvanizing, the care we take in rolling, annealing and handling the sheets insure a permanency that cannot be overlooked in planning and deciding the specifications for an important building.

Contractors Favor the Better Metal—Armco Iron.

Contractors have come rapidly to see the worth to them of using Armco Iron. It adds an extra quality to their work at no increase in labor cost. It gives them the prestige that comes with having the good condition of a building, after years of use, remarked upon.

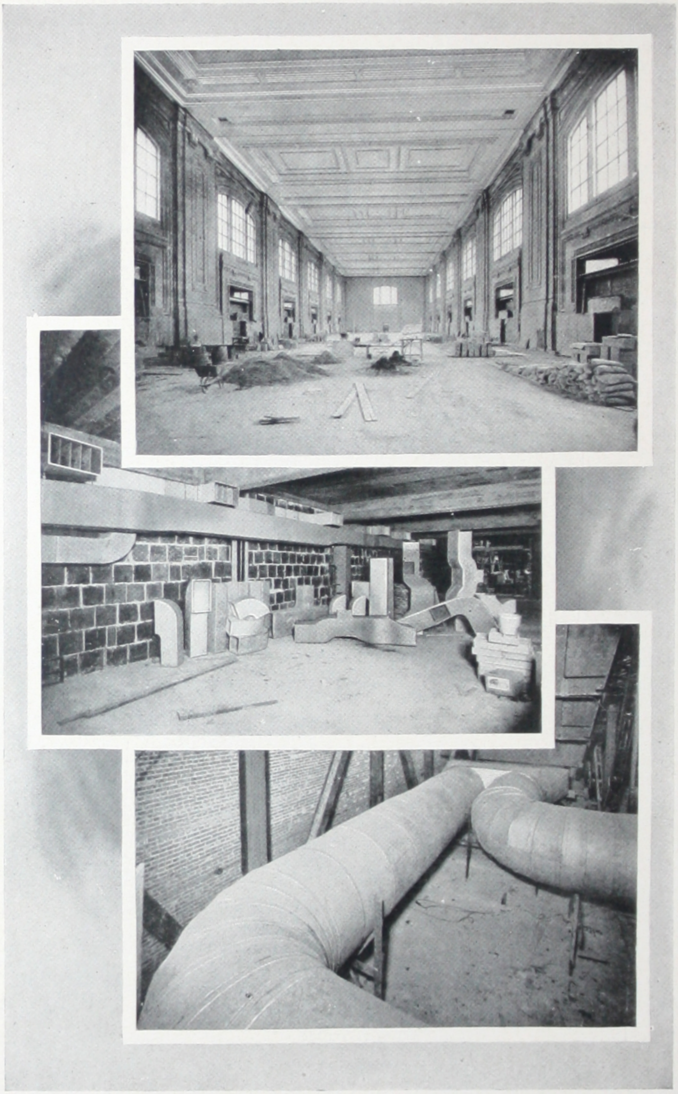
The use of Armco Iron prevents that deterioration which brings with it the suspicion of the owner that the contractor did a half-baked job.

Owners Who Investigate Demand Armco Iron in Their Buildings.

The cases cited in this book of proven superiority of Armco Iron could be multiplied many times, but are enough to show the high regard Armco Iron compels to itself whenever its qualities and properties are investigated and tested.

Some of the greatest buildings in the world stand as incontrovertible witnesses to the regard in which Armco Iron is held by owners, architects and contractors.

Armco Metal Lath was used exclusively in the Woolworth Building in New York City.



Armco Iron in the heating plant of the Kansas City Union Station.

The Railway Exchange Building in St. Louis has four thousand Armco Iron window frames, manufactured by J. E. Ruth and specified by the architects—Mouren, Russell & Crowell.

McKenzie, Vorhees & Gumelin specified Armco Iron for all window sash in the magnificent Fidelity & Casualty Building in the downtown financial district of New York.

Chicago, another city of giant buildings, has many of her skyscrapers insured against rust and corrosion with Armco Iron. The sash for most of these buildings was furnished in Armco Iron by Voightmann & Company of that city.

Voightmann & Company have long used Armco Iron and have yet to receive the first complaint.

Armco Iron in Heating and Ventilating.

If roofing or siding goes wrong the fact is immediately apparent and repairs can be made. In ventilating or heating ducts and pipes extra pains must be taken to be right in the beginning. They should be as permanent as the building. It was this demand for permanency, this demand for a rust-resisting and non-corroding heating plant, that led to the use of Armco Iron in the mammoth new Union Station at Kansas City, Mo. The views given here show various stages in the installation of 300,000 pounds of Armco Iron galvanized sheets in the heating and ventilating plant of that station.

Armco Iron Roofs.

When the Pennsylvania Engineering Works erected a new cast house for the Bethlehem Steel Company they selected Armco Iron sheets for the roofing. This roofing has stood up under the corroding fumes and gases for the three years it has been in service and shows no signs of weakness yet.

Few buildings of any kind have to withstand such conditions as surround the usual coal tipple. They stand in a sulphuric atmosphere. They are covered with coal dust. They are racked with the running of heavy machines. The selection of Armco Iron for both the siding and roofing of tipples shows its ability to stand up under the most destructive conditions.

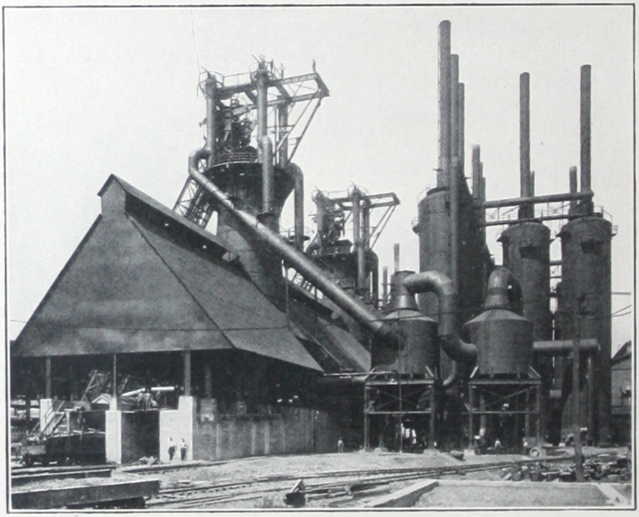
Armco Iron Roofing is also in service in sugar mills, iron works, pressed steel car factories, plate glass works, steamship piers, cement plants and thousands of homes, office buildings, warehouses, stables, garages, etc.

Armco Iron can be furnished in painted or galvanized, corrugated, V-crimped, pressed standing seam, roll roofing or other styles. Armco Old Style Terne Plate is furnished for flat roofs or made up into shingles. We also make tinned and galvanized shingles of Armco Iron. They are fireproof, waterproof and of handsome design.

The Reasons for the Superiority of Armco Iron Roofing.

The superiority of Armco Iron Roofing depends broadly upon two features:

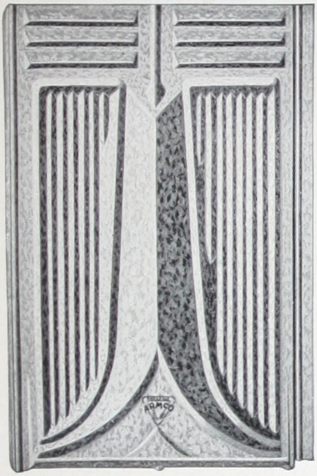
First, the iron itself, the core, the heart of the roofing. Second, upon the quality of the galvanizing, terne plate or other protective coating.



Cast House of Bethlehem Steel Company with Armco Iron Roof.

Armco Old Style Tin Roofing

The process of making Armco Old Style Tin Roofing, consisting of seven pots — seven distinct operations — is called the Pure Palm Oil, Hand Dipped, Morewood Process.



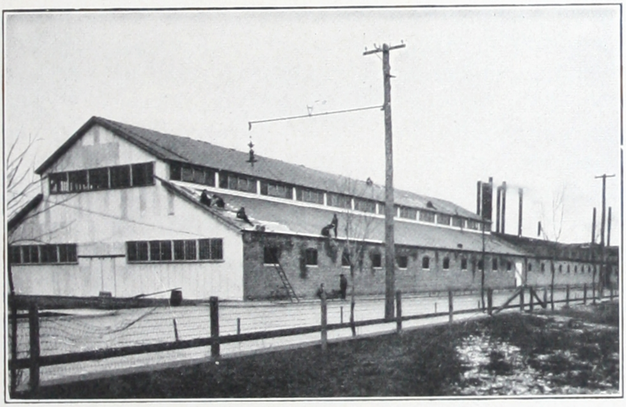
Armco Old Style Terne Plate Shingle. Painted or galvanized.

The result is the highest grade tin roofing that can possibly be manufactured. It means a roof that is permanent — a roof to which might be applied the term everlasting.

It will pay anyone who is at all interested in or connected with construction of any kind to see samples of Armco Roofing.

Take up the question of the style and roofing best suited to your needs with our Service Department.

And this service applies as well to all other uses for which Armco Iron is preeminently fitted in the building world.



Warehouse roofed with Armco Shingles.

Armco Sheets are Trade-Marked.

The Armco Iron trade-mark appears in blue on all galvanized, black or painted sheets, and the word "Armco" is stamped in the nailing edge of every Terne Plate shingle.

Roofers, tinners, sheet metal workers, handlers of sheet metal of any kind can supply you with Armco shingles, sheet roofing and siding.

Corrugated Armco Iron

Black, Painted or Galvanized.

Can be used for Roofing, Siding, Ceiling, Arches, Shutters and Awnings.

Corrugated sheets impart great strength to a building. They are light and durable and permit the use of a light frame work.

Armco Corrugated Sheets, with their lasting and fire-proof qualities, are superior to other materials, and also cheapest in the long run.

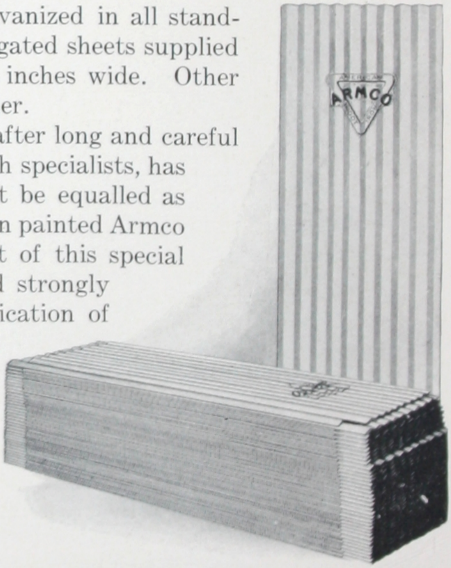
Nos. 26 and 24 are more generally used than any other gauges for roofing and siding, although we keep in stock all even gauges from No. 28 to No. 10. No. 26 is always shipped when no gauge is specified.

When we are furnished with accurate dimensions of a building we cheerfully make estimates as to the amount of material required to cover it. Regular stock sheets for siding are 26 inches wide, and can be furnished in 5, 6, 7, 8, 9 and 10-foot lengths, and from No. 28 to No. 16 gauge.

For roofing we furnish and recommend 2½-inch corrugated 27½ inches wide after corrugating. This allows for one and one-half corrugation laps with 24-inch covering width.

We carry this in stock, galvanized in all standard even lengths. 3-inch corrugated sheets supplied in all even stock lengths, 26 inches wide. Other lengths and widths rolled to order.

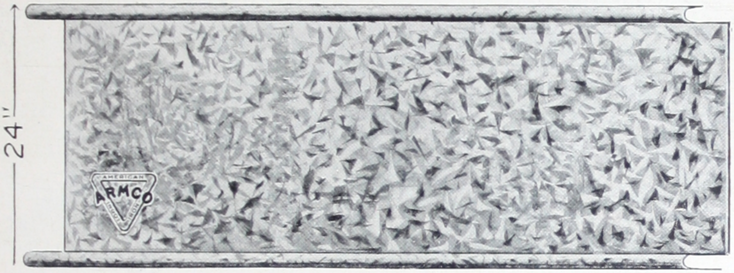
Our Research Department, after long and careful experiment and consultation with specialists, has developed a paint which cannot be equalled as a protector of sheet metal. When painted Armco Iron is ordered, we apply a coat of this special Armco Red at the factory, and strongly recommend that another application of the same be given after the material is in place. Ordinary paints too often serve to accelerate rather than to retard corrosion. In order to encourage the use of a genuinely protective coating, we will furnish our customers with Armco Paint at a very low price in consideration of its quality.



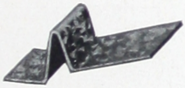
Standard Sizes and Gauges — Roofing and Siding — with corrugations 2½ inches wide. Sheets 26 and 27½ inches wide after corrugating. Stock Lengths in 1¼, 2½ and 3 inch, corrugated sheets; also ⅝ and 3/16 inch corrugated.

Pressed Standing Seam Roofing

Made of Either Painted or Galvanized Iron.



Shows Sheet of Standing Seam Roofing.



Shows Straight Cleat as shipped ready to apply.

Our Standing Seam Roofing, shown above, has all the qualities necessary to make a perfect roof. It is so constructed as to make a perfect water-tight joint. It can be cheaply and easily applied, and can be fitted around angles, valleys, and openings without unnecessary waste. The nails are not driven through the roofing sheets, but through the cleats underneath the sheets. It is very strong, and can not be blown off, and its construction provides for expansion and contraction.

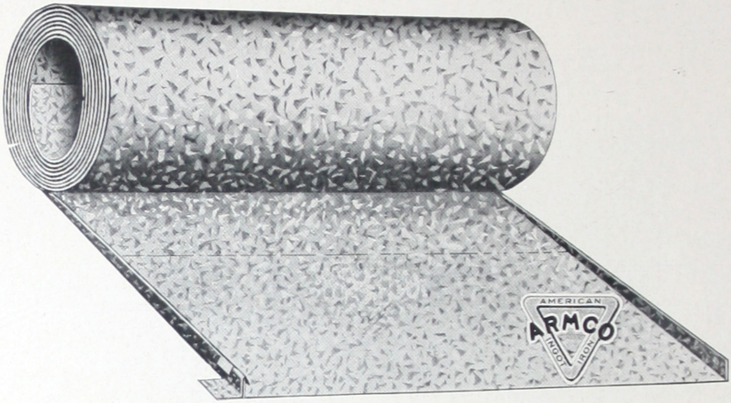
Regular stock sheets of No. 28 and 26 gauge are 24 inches wide, and from 5 to 10 feet in length. 24 and 22 gauge are supplied 25½ inches wide, 12-foot lengths at 10 cents per square additional.

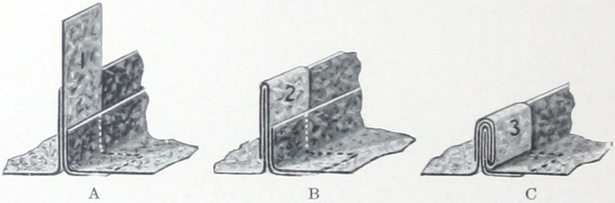
This style of roofing can be taken off and reapplied, with simply the loss of the cleats. If this is to be done, write for suggestions.

We recommend it on buildings having two inches or more pitch to the foot.

4-X Grade Double Cross-Lock Roll Roofing

Made of Either Painted or Galvanized Iron.





A. Shows cleats and sheets in position for seaming.

B. Shows cleat hooked over sheet.

C. Finished double seam.

This style of roofing is especially adapted to roofs having less than two inches pitch to the foot, and is used successfully where only one inch fall is given.

Each roll as shipped contains 50 lineal feet, 2 feet wide after the sheets are seamed together. These rolls are made up of 5 resquared sheets 26½ inches wide, 122 inches long, swedged together, being locked by a power swedger that makes a very close and neat joint.

Our method of laying is very simple, and makes a perfect roof when completed. We do not rivet or countersink our caps, but allow for expansion and contraction in our metal cleat fastening.

This is a very desirable roofing where buildings have the roof pitch one way only, with a slight fall and long courses.

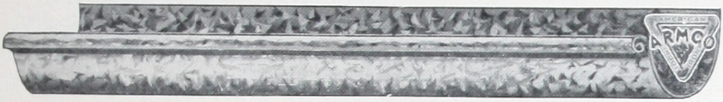
We can furnish Roll Roofing with either single or double cross lock.

Gauges 28 and 26 in galvanized or 26 in painted.

Never Give a Roof Less than One Inch Fall to the Foot.

Lap Joint Eaves Trough

A Perfect and Uniform Eaves Trough.



Made in ten (10) foot lengths of Galvanized Armco Iron. Gauges 28 to 24. Made also in eight (8) foot lengths of 14 or 16 ounce Copper.

MADE IN THE FOLLOWING SIZES:				
3 -inch	4 -inch	5-inch	7-inch	9-inch
3½-inch	4½-inch	6-inch	8-inch	10-inch

3-inch to 6-inch inclusive, ½-inch bead; 7-inch to 10-inch, ⅝-inch bead.

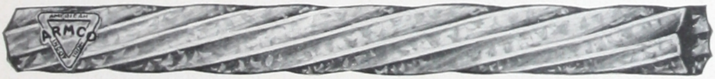
Packed in cases of 250 feet.

Galvanized Conductor Pipe

Gauges 28 to 24.

Round Corrugated Conductor Pipe.

MADE IN THE FOLLOWING SIZES:				
2-inch	3-inch	4-inch	5-inch	6-inch



(Patented. Made only in Armco Iron and Copper.)

Polygon Conductor Pipe.

MADE IN THE FOLLOWING SIZES:				
2-inch	3-inch	4-inch	5-inch	6-inch

The 2-inch size not made heavier than 26 Gauge.

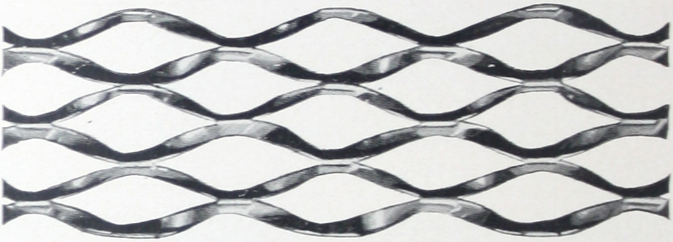
We manufacture a complete line of these goods, such as Lap or Slip Joint Eaves Trough in single or double bead, Octagon, Plain Round and Square Corrugated Conductor Pipe, etc.

Armco Metal Lath

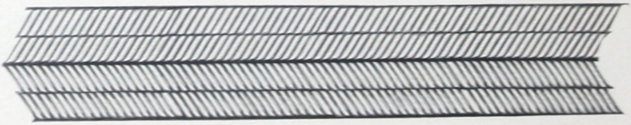
The increasing popularity of exteriors in stucco and the growing demand for fireproof construction has led to the manufacture of Armco Iron Lath, for both indoors and out.

Armco's great rust resistance shows to no better advantage anywhere than in lath.

It does not rapidly deteriorate into a mere network of rust. Rust stains do not come through the plaster or stucco coat to discolor and ruin (so far as appearance is concerned) the walls.



Armco Spiral Expanded Lath.



Herringbone Armco Iron Lath.

With Armco lath, roofing, window frames, ventilator and heating pipes, skylights, gutters, drain pipes, etc., a building can practically be insured against deterioration from rust and corrosion for generations.

Armco Iron in the Home

Manufacturers of metallic articles for household use were quick to see the advantages offered by Armco Iron.

Of these manufacturers, perhaps the makers of stoves are the most enthusiastic because Armco Iron filled a very urgent demand for longer wearing stoves.

Why Stoves Should Be of Armco Iron.

The constant heating and cooling, the corrosive gases of combustion, the vapors of cooking dishes, all tend to hasten rust and corrosion, and the ability to stand up under these conditions has placed Armco Iron first among materials for highest grade stoves and ranges.

Armco Iron Takes a Beautiful Blue Polish.

We furnish polished Armco Iron sheets in a blue finish that is second to none in color, smoothness and appearance.

A Guarantee Against Rust.

A few stove manufacturers are so certain of Armco Iron's rust resistance that they guarantee their stoves against damage by rust for as long as twenty-five years. Armco's unequaled quality as a base for enameling is also highly important in this connection.

Permission has been given us to show several different ranges made wholly or in part from Armco Iron.

The acetylene generating plants put out by several manufacturers are of Armco Iron.

Armco Iron Furnaces.

Furnaces of high grade have their durability assured by durable Armco Iron.

Ash and Garbage Cans.

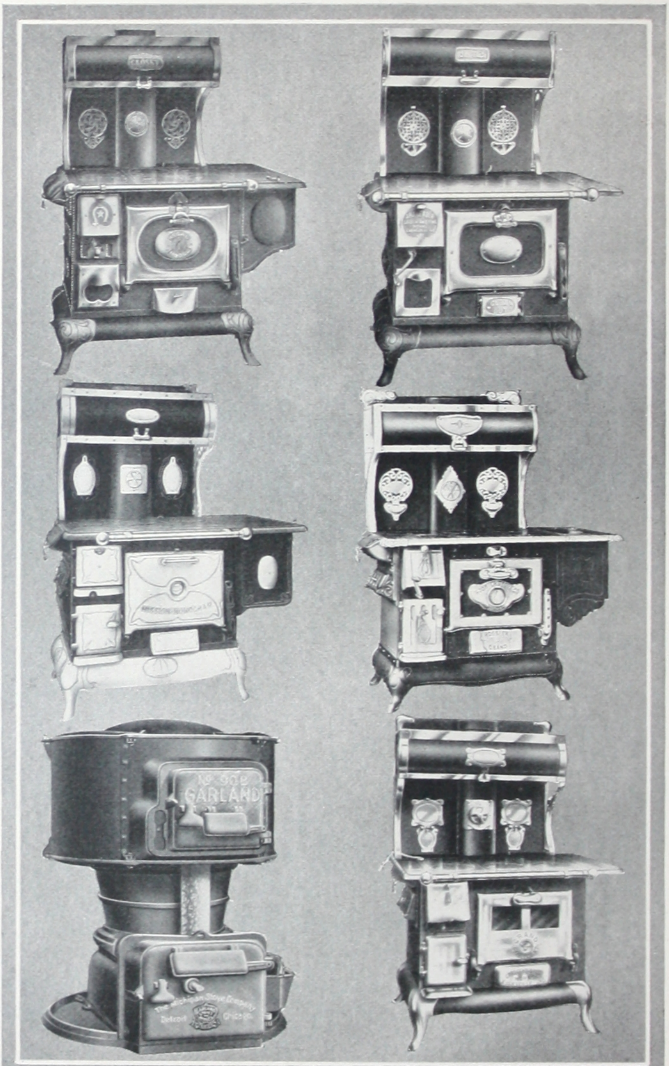
Ash and garbage cans are more durable if made of Armco Iron.

Perfect Welds Give Added Quality.

Stoves, furnaces, sheet metal articles of any kind are superior when made of Armco Iron for reasons besides its rust resistance, especially when parts are welded together.

No matter how welded — by electric point, or by oxygen, acetylene, etc. — Armco Iron gives 100% of perfect welds.

One other great use of Armco Iron in household articles is in enameled ware of all kinds.



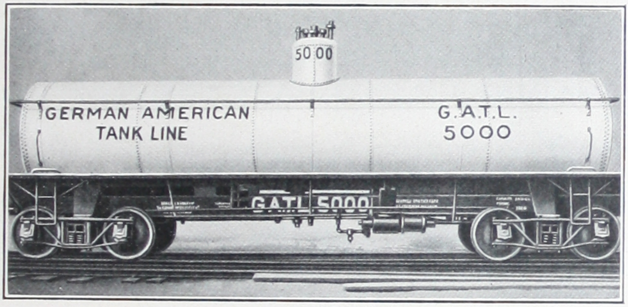
Ranges for Gas and Oil, as well as for Coal, are made from Armco.

Armco in Refrigerators.

The demand for enameled refrigerators grows with the increasing understanding of the value of sanitary measures and precautions. The big difficulty was to get a material for enameling which would not flake or show fish scales. Enamelware made from Armco Iron is not only smooth but, because of the success attained in the elimination of gases, is free from the defects incidental to the use of ordinary steel.

One of the largest refrigerator manufacturers in the country states that he can make a better quality of enamel refrigerators of Armco Iron, and with less losses, than with any other material.

The smoothness of the enamel coat, its freedom from pits and pin holes delight both manufacturer and housewife.



This car was built by the German-American Car Company, of Chicago, for the transportation of sulphuric acid. Nothing but a high resistant to acid would do here. The result was the selection of Armco Iron.

Armco Tin Plate.

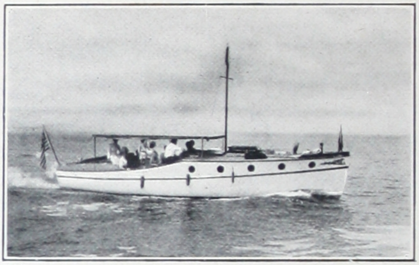
The rapid corrosion of wash boilers, kitchen utensils and dairy utensils, hot air furnace ducts, etc., when made from steel, causing much annoyance and loss, is overcome by using Armco Bright Charcoal Tin Plate. The next time you buy a wash boiler, dish-pan or other kitchen utensil, insist upon seeing the Armco Triangle Trade-Mark. It is your guarantee of satisfaction.

Other Uses for Armco

Armco Iron Cars.

The qualities — workability, perfection in welding, toughness, smoothness, resistance to corrosion and rust—that recommend Armco Iron for other uses, commend it to manufacturers and buyers of metal cars — passenger, freight, tank or mine. For coal mine cars in particular much longer service is secured at a negligible increase of cost.

The advantages of pure and durable iron for Guy Rods and other pole line hardware are now becoming evident, and these lines are being placed on the market by progressive manufacturers.



This little 35-foot Dreadnought is built of No. 14 Gauge Galvanized Armco Iron.

Armco Iron for Boats.

When boat builders and boat buyers in general come to a realization that they can reduce deterioration from rust to about one-tenth what it now is, it will be hard to dispose of a boat not protected against rapid rust by a use of Armco Iron plates.

The government of the United States is investigating Armco Iron with the idea of adopting it in specifications for the lighter vessels of the Navy — submarines, torpedo boats and torpedo boat destroyers.

The builder of this vessel has used Armco Iron for four or five years and the years have brought no cause for complaint.

Armco Iron is making a very creditable record in Sugar Evaporators, in the forms of plates and tubes.

Armco Iron in Electrical Machinery.

The welding and electrical properties of Armco Iron make it unexcelled in the electrical field. Tests prove that Armco Iron has a conductivity 50 per cent. higher than ordinary steel. Other electrical properties, such as high permeability and low residual magnetism, open a large field for the use of Armco Iron for special purposes.

Practical experiments have shown the efficiency of Armco Iron telephone and telegraph wires. Electrified railroads in England already have miles and miles of Armco Iron Third Rails.

Armco Iron on the Farm.

Fencing and Posts.

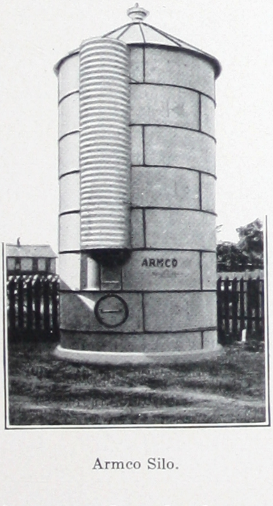
The inability to get rust-resisting wire fences was long a sore spot with American farmers. The Department of Agriculture at Washington investigated and issued bulletins. The question was never settled until Armco Iron was drawn into wire and woven into fencing. A very efficient type of Fence Post is now available in this material.

Watering Tanks.

Watering tanks for stock made of Armco Iron can now be secured almost anywhere.

Silos.

Recently a culvert manufacturer saw the possibilities that lay in Armco Iron for silos. Its resistance to acids, its lack of rusting, its strength and the ease with which a silo made of it can be erected, have already gained favorable recognition from practical farmers for Armco Silos.



Armco Silo.

High standards of material and of construction are in perfect harmony with high standards of business conduct.

With absolute confidence, we point to a record of fair dealing during past years as an indication of our future policy.

The Republican Publishing Company
Hamilton, Ohio.